Nomenclatural Notes

Type specimens: dead or alive?

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It is a widespread misunderstanding that an animal species cannot be given a scientific name until a specimen has been killed and preserved as the name-bearing type specimen for that taxon. An example of this misunderstanding was published in *The Daily Telegraph* magazine *Weekend* (London; 17 November 2001). The leading article by Sandy Mitchell claimed that it had been necessary for a scientist (Julia Robinson Dean) to return to Indonesia to kill a rare bird before she could name it and thereby allow it to be added to a list of protected species. A letter outlining the error was sent in response to the magazine article by the then Executive Secretary of the Commission, Philip Tubbs. However, the letter was not published.

The Code does not require a museum specimen as type material or that the naming process requires an anatomically detailed description to be made on the basis of such material. However, every new name must 'be accompanied by a description or definition that states in words characters that are purported to differentiate the taxon' (Article 13.1.1 of the Code), and since January 2000 the specimen (holotype) or specimens (syntypes) on which the name is based must be explicitly stated (Article 11.6.4.1).

In the case of the Indonesian bird, a description based on notes from the scientist's notebook, or even the picture and description that appeared in the newspaper article, would have been sufficient to make the name available. The holotype or syntypes remain the specimens of which the photographs were taken and the descriptions made, even if they are allowed to return alive to their natural habitat and are never seen again. The holotype (or syntype) is not the picture of the specimen (see Articles 72.5.6 and 73.1.4). Similarly, when a new species is described and named on the basis of DNA sequences, the specimen from which these were taken remains the holotype (or syntypes in the case of a series of specimens from which samples are taken). For example, a new species of Somalian shrike was named from a living specimen that was released after samples had been taken for DNA analysis (see Smith, Arctander, Fjeldsa & Amir, 1991; Hughes, 1992).

There are good reasons why a dead specimen cannot be required for formal naming. Capture, killing and export may be illegal, unethical or impossible (e.g. capture of a new taxon of fish seen from a deep-sea submersible may not be practical) and absence of a museum specimen to act as holotype does not prevent the naming process. Many thousands of names would be invalid if dead type specimens were mandatory. For example, many of the species named by Linnaeus were not based on

any cited type material, and name-bearing specimens have never been fixed for many well-known species.

The misconception that a dead holotype specimen is mandatory under the Code has perhaps arisen from the wording used in relation to designation of new species in early editions of the *International Code of Zoological Nomenclature* (1961, 1964) and the *Règles Internationales de la Nomenclature Zoologique* (1905) that preceded them. This misunderstanding has been compounded in textbooks on taxonomy.

However, preserved specimens have never been a mandatory requirement, although they have been (and still are) recommended. In 1926, the *Règles* were translated into English and published as the International Rules of Zoological Nomenclature in the *Proceedings of the Biological Society of Washington*, **39**: 75–104. In this document, Recommendation B (pp. 7R-8R) on Articles 1–3 recommended 'that in published descriptions of a new species or of a new subspecies, only one specimen should be designated as *type*. The specimen itself should be labelled *type*'. Recommendation B was re-presented in the form of Article 72(a) of the First and Second Editions (1961 & 1964) of the Code (p. 75 in both editions). This stated that 'the type of each taxon of the species-group is a single specimen'. In Article 72 of the Third Edition (1985, p. 139) it is explained that 'the term "type" forms part of many compound terms used by taxonomists to distinguish between particular kinds of specimens'. Some of these terms do not refer to name-bearing types.

The wording of the *Règles* and First and Second Editions of the Code (1961 & 1964) might have been held to imply that a holotype could only be designated when a dead specimen was to hand. The Third Edition (1985) did not state that this was not the case, but Article 73(a)(iv) stated that 'designation of an illustration of a single specimen as a holotype is to be treated as designation of the specimen illustrated; the fact that the specimen cannot be traced does not of itself invalidate the designation'. This clearly indicated that a preserved specimen was not a mandatory requirement of the Code. Eligibility for name-bearing type status was stated in Article 72(c). In addition, the introduction to the Third Edition of the Code (1985) stated (p. xvi) that 'although the principle [of name-bearing types] is fundamental, it is still not obligatory for name-bearing types to be designated for new species-group taxa although the Code recommends the practice and provides procedures by which the name-bearing type of any species-group taxon can be discovered and fixed'.

The introduction to the Fourth (current) Edition of the Code (1999) states (p. xxvii) that 'when the name-bearing type of a species group taxon proposed after 1999 consists of a preserved specimen or specimens, the proposer is required to include a statement naming the collection in which the name-bearing type is or will be deposited'. From this statement, it is clear that a dead type specimen is not essential under the Code. However, it is desirable that this should be stated directly, rather than just by implication, in future editions of the Code to prevent nomenclature and taxonomy from being wrongly discredited in situations of biological conservation sensitivity or where modern techniques (e.g. blood sampling for molecular analysis etc.) are a viable alternative to killing specimens.

In the future, it may be possible to describe all species solely on the results of molecular analysis techniques from blood or other samples taken from living animals. For the time being, it is still desirable to have preserved specimens at hand

to allow a full description of new taxa to be made, and for re-examination of those specimens at a later date.

In the case of marine organisms, there are some old nominal species that were based on animals only seen in the water. As no specimens were actually obtained these have not been considered 'taxonomically sound' (William Perrin, personal communication) even though these names remain available under the Code. The following note by Drs Dalebout and Scott Baker on the description of a new whale species illustrates the value of having preserved specimens. The use of morphological comparison and DNA analysis techniques allowed the determination and description of a new animal taxon, which would have been impossible in the absence of preserved material.

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Beaked whales (ZIPHIIDAE) are among the least known of mammals (Wilson, 1992). Twelve new cetacean species have been described in the last 100 years, of which seven were beaked whales, primarily of the genus *Mesoplodon*. This total does not include *M. bahamondi* Reyes, Van Waerebeek, Cárdenas & Yañez, 1995, a species now recognized as synonymous with *M. traversii* (Gray, 1874) (van Helden et al., 2002). Given this synonymy, the most recently described beaked whale species was *M. peruvianus* Reyes, Mead & Van Waerebeek, 1991.

Sightings of beaked whales at sea are generally rare due to their elusive habits and preference for deep oceanic waters. Several species have yet to be seen alive and the distinctiveness of others has been questioned. Species of beaked whales are comparatively undifferentiated in external morphology. Species identification is based primarily on features of cranial morphology and, especially for the most species-rich genus *Mesoplodon*, on the size, shape and position of the teeth in the lower jaw. All beaked whale species (except the monotypic *Tasmacetus*) have a highly reduced dentition, retaining only one or two pairs of teeth in the lower jaw. In genera with a single pair of teeth, such as *Mesoplodon*, the teeth develop and erupt from the gum only in adult males. Females and juveniles are effectively toothless. These teeth are not used for feeding. Instead, based on observations of scarring patterns on stranded animals, males use these tusk-like teeth as weapons in intra-specific combat with other males (see Heyning, 1984). Due to the often small number of known specimens, pronounced sexual dimorphism and wide geographic distribution (all oceans except the high Arctic), the potential for the misidentification of beaked whales based on morphological features is considerable, even for experts.

In the mid to late 1970s, four beaked whales (an adult male, an adult female and two calves) were stranded within 50 miles of each other along the southern coast of California. These animals were identified as *Mesoplodon hectori* (Hector's beaked whale) from morphology, the first and only records of this species from the Northern Hemisphere (Mead, 1981). Three of the specimens were collected for the Smithsonian Institution National Museum of Natural History, while the fourth was collected for the Los Angeles County Museum of Natural History.

In 1997, a database of mitochondrial (mt) DNA control region sequences was compiled to assist in beaked whale species identification (Henshaw et al., 1997; Dalebout et al., 1998). All specimens in this reference database were validated through examination by experts in cetacean morphology and the collection of diagnostic skeletal material or photographic records following the recommendations of Dizon et al. (2000). A sequence from one of the California specimens was included in the database but was found to differ from specimens of Southern Hemisphere *M. hectori* and all other species in the database at that time (Dalebout et al., 1998).

To investigate this anomaly, DNA was extracted from cartilage and tooth material from the remaining three California specimens described by Mead (1981). Phylogenetic comparisons of mtDNA control region and cytochrome *b* sequences from these specimens to a now complete reference database including all 20 recognized beaked whale species (Dalebout, 2002; see also www.dna-surveillance.auckland.ac.nz) confirmed that all four are of the same species, yet do not represent *M. hectori* or any other known ziphiid species. A fifth specimen, a calf stranded at Monterey in 1997 and initially identified as a neonate *Ziphius cavirostris* (Cuvier's beaked whale) from external morphology, is also grouped with these anomalous California specimens in phylogenetic analyses. These analyses provided strong evidence that these five specimens represent a previously undescribed species of beaked whale (Dalebout et al., 2002). This conclusion was confirmed through phylogenetic analysis of nuclear DNA sequence data (Dalebout, 2002) and supported by re-examination of morphological features (Dalebout et al., 2002).

A formal description of this new species including details of diagnostic molecular and morphological features was given by Dalebout et al. (2002). This species, like *M. hectori*, is a small beaked whale, approximately 4 m in length, with a relatively short rostrum (beak/upper jaw). Both species have a single pair of triangular teeth set at the apex of the mandible, but there are subtle differences in position and angle of inclination. Of the four specimens stranded in California in the 1970s, the adult female and one of the calves share the same mtDNA haplotype (the mitochondrial genome is inherited only through the maternal line). These specimens were found a week apart and are probably a mother and her offspring. There are no confirmed observations of this species at sea and little is known of its ecology. We assume that like many other beaked whales, these animals eat mainly pelagic squid. The adult male bore a number of white, linear scars on its postcranial flanks, probably inflicted by the teeth of conspecific males. Although the stranding pattern of the five specimens known to date is suggestive of an eastern North Pacific distribution, there are too few records to date to draw any bounds on this. We have named this new species *Mesoplodon perrini* (Perrin's beaked whale) in tribute to the American

cetologist, William F. Perrin, of the U.S. National Marine Fisheries Service South West Fisheries Science Center (La Jolla, California) for his role in the collection of two of the known specimens of this species and his ongoing contribution to marine mammal science and conservation.

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Acaulona peruviana Townsend, 1913 (Insecta, Diptera): application of Article 75.8 of the Code

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In 1913, Townsend (p. 93) described a species of parasitic fly (family TACHINIDAE) and named it *Acaulona peruviana*. His description was based on two reared specimens (a male and a female), from San Jacinto, Chira valley, Piura Department, Peru. They emerged as adults on 29 October 1912, having been collected by E.W. Rust from adults of the cotton stainer bug *Dysdercus ruficollis* (Linnaeus, 1764) (Hemiptera,